

City of Naperville, IL

City of Naperville Smart Grid Initiative

Abstract

The City of Naperville Smart Grid Initiative involves a city-wide deployment of an advanced metering infrastructure (AMI) and an expansion of distribution automation capabilities, which include circuit switches, remote fault indicators, and smart relays. Customers are allowed to purchase devices that assist in managing electricity use and costs, including in-home displays, programmable controllable thermostats, and direct load control devices for participation in load management programs. These programs allow: (1) participants to view their energy use through in-home displays, a Web portal, or both; and (2) Naperville to manage, measure, and verify targeted demand reductions during peak periods. The new AMI and distribution automation technologies are intended to help improve service quality and reliability, by enabling outage management, distribution circuit monitoring, and automated circuit switching.

Smart Grid Features

Communications infrastructure consists of a new digital mesh radio network from each substation to meters and distribution automation devices, and an existing fiber backhaul network from the substations to the utility operations center. This infrastructure provides Naperville with expanded communication capabilities to better understand and integrate customer information, energy delivery system operations, and system reliability information.

Advanced metering infrastructure includes the deployment of about 57,000 smart meters throughout the entire City of Naperville as well as supporting data management and information technology infrastructure. This system provides automated meter reading, improved meter accuracy, enhanced outage detection, power quality monitoring, and improved meter tampering detection. A new meter data management system and load control management system provide expanded capabilities to analyze, interpret, and query meter readings and power usage information, which improves Naperville's billing and electricity management efforts and load forecasting abilities.

Advanced electricity service options leverage the load control management system and include customers (1) with programmable controllable thermostats, in-home displays, or other

At-A-Glance

Recipient: City of Naperville, IL

State: Illinois

NERC Region: ReliabilityFirst Corporation

Total Budget: \$21,988,220

Federal Share: \$10,994,110

Project Type: Integrated and/or Crosscutting
Systems

Equipment

- 57,000 Smart Meters
- AMI Communication System
- Customer Systems (voluntary)
 - Web Portal Access for Customers
 - In-Home Displays/Energy Management Systems
 - Programmable Communicating Thermostats
 - Direct Load Control Devices
- Distribution System Automation/Upgrade for 5 of 117 Distribution Circuits
 - Feeder Monitors/Indicators
 - Automated Feeder Switches

Advanced Pricing Programs Targeting 1,500 Customers

- Time of Use
- Dynamic Pricing (Critical Peak Pricing Overlaid to Time-of-Use rates)
- Other Incentives and Rates (e.g., Residential Demand Response Incentive and Charging Station Rates)

Key Targeted Benefits

- Reduced Electricity Costs for Customers
- Reduced Operating and Maintenance Costs
- Deferred Investment in Distribution Capacity Expansion
- Reduced Costs from Equipment Failures and Distribution Line losses
- Reduced Greenhouse Gas Emissions

City of Naperville, IL (continued)

home energy devices; and (2) who volunteer to receive direct load control devices that control appliances and equipment in homes and businesses. Access to a Web portal provides customers with the ability to interact with these devices and receive information on their electricity use. Combined with the deployment of advanced pricing programs such as time-of-use pricing, customers are empowered to, and have the incentive to, shift their use and reduce their peak demand.

Advanced pricing programs include time-of-use rates and a demand response incentive, future electric vehicle charging station rate, renewable energy sources rate. These pricing options are designed to encourage customers to reduce and/or shift their consumption from peak to off-peak periods, reducing overall peak demand and saving energy thereby reducing greenhouse gas emissions and costs of additional generation at peak times. Commercial customers have the option of different demand rates for peak and off-peak periods. A net metering program allows customers with their own generation devices to sell excess power back to Naperville. Advanced pricing programs will be rolled out gradually in conjunction with traditional flat rates.

Distribution automation systems include automated switches, feeder monitors, and remote fault indicators integrated with the substation automation system on five distribution circuits. This reduces the frequency and duration of service interruptions while also reducing field operations requirements. Combination of existing and new feeder monitoring switches and smart meters will allow Naperville to take steps in their Conservation Voltage Reduction program. System reliability, power quality, and energy savings are targeted benefits of this upgrade.

Timeline

Key Milestones	Target Dates
Utility system assets deployment begins: distribution automation, substation automation, supervisory control and data acquisition (SCADA) and AMI)	Q2 2010
Pricing program roll-out begins	Q1 2012
AMI/distribution automation/distribution management system asset deployment completed	Q2 2012
Utility system integration (e.g., outage management system, and distribution management system) completed	Q2 2013

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